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MEMORANDUM FOR: DISTRIBUTION

FROM: BEVERLY A. COOK
ASSISTANT SECRETARY
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

SUBJECT: Emergency Response and Recovery Lessons Learned From Terrorist Attacks

The purpose of this memorandum is to provide lessons learned for potential application to facility (including Forrestal and Germantown) emergency response planning.

The emergency response and recovery work at the World Trade Center, the Pentagon, the American Embassies attacked in Africa, and the Murrah Building in Oklahoma City were studied for lessons by some well-respected research organizations. My staff has compiled the attached lessons learned synopsis from reports prepared by the RAND Corporation and McKinsey & Company. The attached paper summarizes lessons that may present opportunities for the DOE Complex to better prepare for emergency response and recovery from disastrous attacks.

Should you have any questions, you can reach me at 202-586-6151, or your staff can contact Chip Lagdon at 301-903-4218.

Attachment

cc:
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EMERGENCY RESPONSE AND RECOVERY
LESSONS LEARNED FROM TERRORIST ATTACKS

Introduction and Background

After the terrorist attacks on the World Trade Center (WTC) on September 11, 2001, there were important studies of several terrorist attack emergency responses and recovery efforts for lessons learned. RAND Corporation held a conference in December 2001 covering the WTC, Pentagon, African Embassy, and Murrah Building attacks. McKinsey and Company spent five months working with New York City Fire Department (FDNY) personnel to develop recommendations to enhance FDNY preparedness. The McKinsey report, *Recommendations for Change to Enhance FDNY's Preparedness, (2002*), and the RAND report, *Protecting Emergency Responders, Lessons Learned from Terrorist Attacks, (2001)* are excellent Lessons Learned reference reports for all types of emergency response and preparedness organizations. As stated in the McKinsey report, "The terrorist attacks on the World Trade Center on September 11, 2002, reshaped expectations about future threats and created a new urgency to increase preparedness."

With that in mind, the Department of Energy (DOE), Office of Environment, Safety and Health reviewed the reports to extract valuable Lessons Learned and recommendations which may be of use in improving the readiness and capabilities of DOE emergency response and preparedness programs across the DOE complex. The following is a summary of the recommendations potentially useful to DOE facilities, focusing on:

- Personal Protective Equipment
- Management
- Hazards Assessment
- Training

Personal Protective Equipment (PPE)

In the aftermath of the WTC disaster, recovery workers, many of whom were firefighters, did not transition to appropriate PPE during recovery operations. Firefighters' turnout gear and self-contained breathing apparatus (SCBA), normal firefighting gear, were not appropriate for the extended stays and hard work associated with recovery operations. As a result, turnout gear and SCBAs were not worn, but appropriate PPE were not substituted and much of the recovery work was performed without appropriate head, eye, respiratory, skin, and foot protection, leading to unnecessary injuries. The problem was exacerbated by the presence of many volunteers and lack of access control for the site.

Most large DOE sites have the capability to select, issue, clean, and maintain PPE. In the event of a large-scale recovery from an attack, it may be necessary to quickly scale-up this capability. Some approaches that will help make this possible are pre-arrangements and standardization. Pre-arranged sources for PPE and breathing air can cut the response time to scale up. Standardization of the equipment used in a protective ensemble can simplify cleaning and

maintenance during an extended recovery operation. Standardization can also improve compliance and enforcement of requirements to wear PPE.

Management and Planning

Organizational Structure. All the events studied showed that emergency response and follow-on recovery operations run best when there is a single controlling authority, with a flexible command and control structure that can quickly expand in the event of a major emergency to handle information, equipment logistics and site enforcement. Back-up senior personnel were especially important in the World Trade Center event when many commanders were lost in the tower collapses. Good relationships with other agency leaders based on joint training and working together were very useful under emergency response circumstances. The Incident Command System (ICS), a blueprint for emergency response used by many local, state and federal agencies across the country, has proven valuable in managing emergency response and recovery operations. It may help DOE in dealing with outside supporting agencies if we understand the ICS they use.

Perimeter control. At the WTC recovery, poor access control led to problems with personnel accountability and use of PPE. The Pentagon recovery effort, in contrast, featured immediate and effective scene access control. Terrorist attack sites are also crime scenes, and must be treated as such during all phases of the response. At the Pentagon, the site was isolated and put under a single commander for access control. A single control agency with a single set of credentials and accountability records helps ensure that only authorized persons are allowed in and can help enforce PPE requirements for workers. A special set of credentials linked to a central database could track worker fitness for various PPS ensembles and ensure all persons are accounted for.

Interagency coordination. A large event may involve responders from many fire departments, police forces, and Federal agencies. Coordination and standardization must occur *before* an event, not in the heat of fighting a catastrophe. Agencies that establish common command and control structures and terminology, interoperable communications infrastructures and protocols, and joint training exercises will be better able to function effectively during a real incident. Equipment standardization and procedural coordination, in addition to the interagency coordination aspects, can help ensure responding personnel can work together effectively.

Resource management. Resource management during a disaster response is likely to be very complex. Timing, or time of day, may also be a factor. Tracking response personnel and patients on the site can be an extremely difficult task. In the WTC event, matters were confused because the event occurred at shift change, so both day and night fire teams responded. Staging areas were not well used, and commanders did not know who was on site or where their people were. The McKinsey Report recommended that responders report to a designated staging area before going on site, and that back-up response equipment be staged in this area as well. As part of Interagency Coordination *before* an event, responders could develop and formalize mutual aid policies and establish agreements with other agencies to provide for efficient resource pooling. Large events can quickly involve all the on-shift personnel, so a tested recall procedure for off-duty personnel would be needed to call in more help. Since “ordinary” events will still occur

during a large disaster response, emergency services will still be required in other locations and some resources will need to be preserved for this.

Communications. Many communications systems failed in the WTC event. Installed firefighter repeater radios in the towers failed, and the responders had only limited communications from their command posts to the scene. Since Dispatcher orders were not acknowledged, Dispatchers did not know that some units did not receive vital information that was transmitted while they were in tunnels or otherwise out of communications. Communications between responding organizations also present problems- communications between firefighters and police in New York were hampered by equipment and procedural differences so warnings to evacuate were sent to police but not firefighters. DOE emergency response communications technology and procedures may need attention to ensure they function in extreme circumstances and that all response organizations share a common method.

Information. Emergency response managers need some vital information: the overall situation, what hazards they may be dealing with, and who is involved, both responders and victims. Some of this can be prepared in advance- hazards, personnel in the facility, and any special conditions. Tracking responders and victims and keeping the big picture will require careful forethought, design, and testing of record keeping and presentation systems before need. Later in a response and recovery, family notification becomes important, pointing out the need for accurate family contact information facility personnel accountability methods.

Other Areas. The terrorist attacks pointed out the need for extensive hazardous materials capabilities, including HAZMAT units. Managing large events also pointed out the value of pre-designated and experienced incident management teams comprised of specialized, highly trained individuals who could respond to major incidents.

Hazards Assessment

While not directly applicable to the September 11 World Trade Center disaster, the McKinsey Report recommends increased preparedness for a nuclear, biological or chemical (NBC) attack. The key step is the capability to detect and characterize an attack with NBC agents. Many of the large DOE field sites have extensive capability to detect and respond to a radiological emergency. The Germantown and Forrestal facilities and many DOE Operations offices have limited capabilities to quickly respond to a radiological incident. Chemical event response in many cases is assigned to local fire department HAZMAT teams, and biological event response may not be part of response planning. Improved preparedness at DOE sites too large or too remote to rely on community mutual aid agreements may require improved capabilities to respond to a chemical or biological emergencies.

Chemical Agent Detection. Chemical warfare agent detection methods include both military and commercial equipment. Military gear includes indicator papers that change color in response to airborne blood, nerve, and blister agents, indicator kits for swiping and painting surfaces to detect contamination, and electronic air samplers based on ion mobility spectrometry. Commercially available air samplers use detector tubes for blood, nerve, and blister agents, and operate exactly like other detector tubes already widely used by Hazmat teams and fire

departments. For more information see http://www.msanet.com. Adding chemical agent detector tubes to the current inventory would be an easy and inexpensive improvement to emergency response capabilities.

A new portable electronic chemical agent detector has been developed for the military and will undergo field-testing in 2003. The instrument uses piezoelectric chips with specific binding sites for chemical agents and promises to have a much lower false alarm rate than current ion mobility spectrometry detectors. The new instrument should be commercially available after initial military orders are met. For more information see http://www.chembiosolutions.com/chemsentry/chemsentry.asp

The most sensitive and specific sampling and analytical method for chemical warfare agents is to draw an air sample through adsorbent material (usually Tenax® adsorption tubes) and then analyze the sample with a Gas Chromatography/Mass Spectrometry (GC/MS) instrument. This technique is used at operational chemical weapon disposal operations for personnel, perimeter, and stack monitoring. Miniaturized, lower-cost GC/MS instruments are in development and may eventually result in real-time monitors.

For a recovery effort, GC/MS analysis of site samples could provide definitive characterization of the extent and degree of health risk created by an attack or incident. The analysis method requires sophisticated equipment, trained and experienced analysts, and robust chemical surety controls for calibration and validation of the laboratory. This could be justified at sites where there is an ongoing workload due to research and development or other operations involving chemical warfare agents. Other sites could make prior arrangements for shipping samples to labs experienced in this analysis.

For much more information about detecting and protecting against chemical warfare agents, see the U.S. Army's pamphlet *Toxic Chemical Agent Protection Standards* at http://www.usapa.army.mil/pdffiles/p385_61.pdf

Biological Agent Detection. The detection of biological agents requires growing organisms in media for at least 24 hours. The lag time in obtaining results can be minimized by having sampling media on hand and pre-existing agreements for laboratory analyses. Work on real-time biological agent monitors is a high priority, but there is no technology approaching commercialization yet.

Exposure Data Collection. During a recovery effort, it will be important to obtain and maintain information for potential individual exposure assessments. A nuclear/chemical/biological warfare agent emergency response will be one of the most memorable events in a person's life and it would be natural for them to attribute subsequent illness to those events. Although data collection in the heat of emergency response is difficult, the data is invaluable in answering worker questions about their risk and the likelihood of later health effects from exposure to various chemicals or agents. Vital data includes information that identifies potentially exposed individuals, where and when they worked, PPE and other protective measures, sample data, and site working and weather conditions.

Training

The McKinsey report recommended training FDNY personnel on the Incident Command System. The equivalent for DOE facilities would be initial and periodic refresher training for both DOE and off-site emergency response personnel covering the emergency response and management program at the DOE facility, including:

- Facility emergency response program
- Facility recall procedures
- Roles and responsibilities of various responders
- Emergency response communications capabilities and protocols.

The report also recommended initial and periodic training for senior personnel in emergency response leadership roles, including:

- Coordination of the overall response strategy
- Operations (including recall procedures)
- Planning (including creating action plans, use of interagency agreements, and estimation of future resource requirements)
- Logistics (including procurement, receipt and management of equipment and services)

Depending on the circumstances of the disaster, some on-site training may be useful and even necessary. In the WTC, responders got involved in atypical tasks for which they had not been trained or equipped.

One additional training recommendation in the McKinsey report directly relevant to DOE facilities is to conduct joint training drills with potential mutual aid partners.

About This Report

The U.S. Department of Energy's Office of Environment, Safety and Health prepared this report in October 2002.
Authors: Gus Vazquez, EH-412; Pete O'Connell, EH-52; and Paul Wambach, EH-6

Sources:

1. McKinsey & Company, *Recommendations for Change to Enhance FDNY's Preparedness, (2002*) available on line at http://www.nyc.gov/html/fdny/html/mck_report/toc.html

2. Rand Science and Technology Policy Institute, Conference Proceedings, *Protecting Emergency Responders, Lessons Learned from Terrorist Attacks, (2001)* available on line at http://www.rand.org/publications/CF/CF176/